

11

SMOKE CONTROL

Ref.: BMC 23.10.045, IBC 909, IFC 909, NFPA 92A, 92B

11.01 Standards Established

11.01-1 Scope. The purpose of this standard is to clarify existing Code and City of Bellevue Fire Department (BFD) requirements for the design, installation and acceptance testing of smoke control systems. This information is to supplement existing code requirements and does not cover all aspects. This section applies to active and/or passive smoke control systems, and includes shaft pressurization as well as zoned smoke control systems. Questions or comments can be directed to the Assistant Fire Marshal- Plan Review.

Design Approaches may include the Pressurization Method, Airflow Design Method, Exhaust Method, Passive Smoke Control and Performance Based Designs. All of these are defined in ICC standards. The objectives of such designs is to accomplish the following:

- (1) Contribute to the protection of life and to the reduction of property loss
- (2) Provide conditions outside the event zone that enable emergency response personnel to enter for rescue and fire-fighting operations
- (3) Maintain a tenable environment in smoke refuge areas and exit enclosures, and within the event zone when utilizing the exhaust method, for the required duration
- (4) Inhibit smoke from entering stairwells, smoke refuge areas, elevator shafts, or similar areas
- (5) Inhibit the migration of smoke from the event zone

11.01-2 Smoke control (when required). The IBC requires the following smoke control systems:

- (1) High-rise Buildings (403.13)
- (2) When utilizing footnote (e) of Bellevue Amended Table 503 (503)
- (3) Pressurized Shafts/Smokeproof Enclosures (1020.1.7)
- (4) Underground Buildings (405.5)
- (5) Building Atriums (404.4)
- (6) Windowless Buildings (408.8)
- (7) Stages and Platforms (410.3.7.2)
- (8) Covered Mall Buildings (402.9)
- (9) Assembly Seating (1025.6.2.1)

- 11.01-3 Smoke control and smoke management systems shall comply with IBC/IFC Section 909, and this document as determined by BFD.
- 11.01-4 Generally accepted and well-established principles of engineering required by IBC Section 909.2 shall include NFPA 92A and 92B, A Guide to Smoke Control in the 2006 IBC, Dr. John H. Klote, P.E., and Douglas H. Evans, P.E., 2007, International Code Council, Principles of Smoke Management, Dr. John H. Klote, P.E., and Dr. James A. Milke, P.E., 2002, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) and Society of Fire Protection Engineers (SFPE) and Commissioning Smoke Control Systems, 1994, ASHRAE Guideline 5–RA 2001, for design, installation, acceptance testing, periodic testing, and maintenance of engineered smoke control systems.

11.02 Definitions

End-to-End Verification. A self-testing method that provides positive confirmation that the desired result (e.g., airflow or damper position) has been achieved when a controlled device has been activated, such as during smoke control mode, testing, or manual override operations.

Shaft Pressurization (Pressurized Stairwells/Hoistways.) A type of smoke-control approach in which stair shafts and elevator hoistways are mechanically pressurized, to establish prescribed pressure differentials with respect to the event zone, with outdoor air to keep smoke from contaminating them for a duration of at least 2-hour.

Smoke-Control Mode. A predefined operational configuration of a system or device for the purpose of smoke control.

Smoke-Control System. An engineered system that utilizes a combination of passive barriers, mechanical equipment and automatic detection and/or suppression to inhibit smoke movement from the event zone to other smoke zones.

Dedicated Smoke-Control System. Smoke-control systems and components that are installed for the sole purpose of providing smoke control, and upon activation these systems operate specifically to perform the smoke-control function. They include components that do not function under normal building operating conditions, such as stair pressurization fans or smoke control dampers that operate specifically to perform the smoke control function upon smoke control system activation.

Nondedicated Smoke-Control Systems. Smoke-control systems and components that share components with some other system(s), such as the building HVAC system, and upon activation cause the HVAC system to change its mode of operation in order to achieve the smoke-control objectives.

Smoke-Control Zone. A space within a building enclosed by smoke barriers, including the top and bottom.

Zoned Smoke-Control System. A smoke-control system applying the Pressurization Method that includes a relative negative pressure for the event zone and a relative positive pressure for all contiguous smoke-control zones, in accordance with IBC 909.6.

Sandwich Method. A zoned smoke-control system that utilizes a combination of exhaust in the event zone and pressurization in contiguous smoke zones.

Event Zone. The smoke-control zone where the fire event is considered to originate.

Active Zone. A smoke-control zone that utilizes mechanical ventilation for smoke-control during smoke control mode to achieve design objectives.

Passive Zone. A smoke-control zone with no mechanical ventilation for smoke control.

Passive Sub-Zone. A space within an active smoke zone that is not provided with mechanical ventilation for smoke control. The passive sub-zone is not required to be separated by smoke barrier construction.

11.03 Design Requirements

11.03-1 **Coordination of Effort.** Coordinated effort among all parties involved in designing, installing and testing smoke control systems is essential to meet applicable code requirements. It cannot be overemphasized that the design professionals, including the architect, mechanical engineer, electrical engineer, fire protection engineer, City reviewers, as well as all applicable trades including the fire alarm/electrical contractor(s), automatic sprinkler contractor, mechanical contractor and those responsible for construction of smoke barriers, must work together to accomplish a fully functional smoke control system.

11.03-1.1. In buildings or occupancies that are provided with smoke control, in accordance with IBC Section 106.3.4, BFD requires that the owner engage and designate design professionals to function as the architect of record, electrical engineer of record, and mechanical engineer of record for the building.

11.03-1.2. Each of these individuals is responsible for reviewing and coordinating all submittal items prepared by others, including deferred submittal documents, for compatibility with the design of the building in his or her area of responsibility up until the Certificate of Occupancy for the building is issued.

11.03-1.3. Each of these design individuals must be registered or licensed in their particular branch of engineering or architecture by the State of Washington in accordance with RCW 18.235, and will be responsible for the elements of the smoke control system in their

area of responsibility. Appropriate certification must also be demonstrated by fire alarm and fire sprinkler system designers.

- 11.03-2 **Coordination Letters.** A signed statement must be provided from each of the individual designers stating that the designer has read the Detailed Design Report (*see Section 11.04-4*) and has incorporated it into their design, unless the design professional is the author of the report.
- 11.03-2.1. The statement must be included with the separate permit submittals for the Electrical, Mechanical, Fire Alarm, Fire Sprinkler and Building Architectural. Each of these separate permit submittals must also bear the concise narrative description of the smoke control system for the building and any special requirements of the design.
- 11.03-2.2. Submittals of other building permits (i.e. architectural, mechanical, electrical, fire alarm, fire sprinkler) must be reviewed by the author of the Detailed Design Report. The author of the Detailed Design Report must provide a letter stating that they have reviewed these associated permits and they comply with the smoke control design.
- 11.03-3 **2-hour Fire Resistance Rated Protection.** Shaft pressurization equipment (smokeproof enclosure ventilation equipment) is required to be protected in accordance with IBC Section 909.20.6.1. This includes equipment power and control wiring protection as outlined in the Wiring section of this standard.
- 11.03-4 **Garage Ventilation.** Where mechanical garage ventilation occurs in a building with mechanical smoke control, the ventilation system (supply and exhaust) shall operate at 100% in the event of an automatic fire alarm activation in the garage zone, unless the rational analysis requires a different action. When this ventilation system is not part of the building life safety system, emergency power is not required for this system.
- 11.03-5 **Loading Docks.** Truck loading docks and similar facilities located interior of a building that is provided with smoke control requires special consideration. In general, smoke removal for the loading dock area within a building shall have a minimum exhaust volume of 10 air changes per hour.
- 11.03-5.1. Fans for truck loading bays must be on emergency power.
- 11.03-5.2. Fan control must be provided at the FSCP.
- 11.03-6 **Trash Chutes.** Trash chutes equipped with continuously operating fans require the fan to be on emergency power; however, control and status indication of the fan at the FSCP is not required.

11.04 Submittal Requirements

- 11.04-1 Submittal requirements shall be as described in this section, and the appropriate City of Bellevue description sheet (See Appendix):
Sheet 42A – Conceptual Smoke Control Submittal
Sheet 42B – Detailed Smoke Control Submittal
Sheet 42C – Smoke Control System Revision Submittal
Sheet 42D – Shaft Pressurization Only Submittal
- 11.04-2 The Conceptual Design is the initial submittal of the Smoke Control Permit (type FH). It is not part of the Building permit. Once the Concept has been approved, then the Detailed Design is required to be submitted.
- 11.04-3 **Conceptual Design.** The Life Safety Report and zone drawings shall be submitted in accordance with Sheet 42A prior to submittal for the building permit (BB). Approval of the Conceptual Design submittal is required prior to issuance of the Building Permit (BB, BZ).
- 11.04-3.1. **A Life Safety Report** must be submitted as part of the conceptual design. This report must include a general project description of the building, life safety systems and the smoke control methods and objectives that will be applied. The smoke control narrative must detail how the code requirements of IBC 909 will be addressed, and describe the planned activation and operation of the system. This report must also include a description of the various life safety features of the project (sprinklers, fire pumps, reservoirs, standpipe systems, fire detection/alarm/communication system, FCC requirements, firefighter smoke control panel features, emergency power systems, in-building radio system, etc.) and how they will interface with each other. Calculations and computer modeling analysis are not required until the detailed design stage.
- 11.04-3.2. A summary event matrix (Sequence of Operations) for the smoke control system shall be provided with the Conceptual Smoke Control Plans (42A).
- 11.04-4 **Detailed Design.** The Detailed Design shall be prepared as described in Sheet 42B-D, after approval of the Conceptual Design has been granted. This report shall be based on the Conceptual Design and include the required rational analysis. Supporting documents (calculations, manufacturer sheets, zone drawings, special inspector test sheets, etc.) shall be provided as a bound document, independent of design plans, addressing each requirement of IBC 909.
- 11.04-4.1. A rational analysis of the smoke control system is required in accordance with Section 909.4 of the IBC. Such analysis must be prepared by a Professional Engineer competent in the design of smoke control systems. This analysis must include support for the types of smoke control systems to be employed, their methods of

operation, the systems supporting them and the methods of construction to be utilized.

- 11.04-4.2. **Computer Modeling.** IBC 909.4.2 and 909.4.3 requires designs to incorporate the effect of outdoor temperature and wind. The detailed design report shall address the anticipated performance of the smoke control system under extreme climatic conditions and the presence of operable windows or doors. It is acceptable to utilize a computer model, such as the National Institute of Standards and Technology – Building and Fire Research Laboratory software program CONTAM for such analysis. It should be noted that Klote and Evans’ “A Guide to smoke control in 2006 IBC state on page 4-9 that “*A network computer program such as CONTAM should be used for the rational analysis*” of buildings with zoned smoke control and pressurized stairs and pressurized elevators.
- 11.04-4.2.1. Residential Towers with operable windows, accessible balconies, shaft pressurization and zone smoke control will be required to computer model the smoke control systems or provide an engineering justification as to why such modeling is not necessary.
- 11.04-4.3. **Smoke Zones.** The architect of record must prepare smoke zone plans, with an appropriate legend showing the locations of all required smoke barriers as outlined in the detailed design report and described in Sheet 42B-D. Zone drawings shall clearly identify (through the use of cross hatching or color coding) all passive and active zones.
- 11.04-4.4. Designation of smoke zones/smoke barriers is a coordinated effort between the architect and mechanical engineer. Smoke zones must also be coordinated with fire alarm initiating devices (including automatic sprinkler systems) which activate mechanical smoke-control systems. Smoke zones are expected to be coordinated/documented in the Life Safety Package.
- 11.04-4.5. Floors define passive smoke zones. When floors are open to each other, the interconnected levels may be viewed as a single smoke zone.
- 11.04-4.6. Pressurized stair entrance vestibules and all other adjacent portions of the building always constitute separate smoke zones.
- 11.04-4.7. Stair enclosures and exit passageways must always be designed as completely independent smoke zones.
- 11.04-4.8. Rated corridors constitute passive smoke zones. (Ref. IBC 715.4.3.1)

- 11.04-4.9. Horizontal exits always constitute smoke barriers. (Ref. IBC 1002)
- 11.04-4.10. The architect, engineer of record, author of the detailed design report, or special inspector shall prepare a Special Inspector Test Procedure in accordance with IBC Section 909.3 and Sheet 42B-D that will be submitted to the City of Bellevue for review and approval with the smoke control (FH) permit. The document shall be provided as a bound document, independent of the design plans. It can be included in a binder with the detailed design report.
- 11.04-4.11. A detailed event matrix that includes every fire alarm and smoke control initiating device down one column, and every fire alarm notification device (by zone), every smoke control device (i.e. fans, dampers, etc.), and every other event that must occur in order for proper operation of the smoke control system (i.e. HVAC shutdown, etc.) across the top. With prior approval, some devices may be combined.
- 11.04-4.12. The proposed layout of the Fire-fighter's Smoke Control Panel (FSCP) for smoke control override features in accordance with IBC Section 909.16 must be included with the Detailed Smoke Control Submittal.

11.05 Fire-fighter's Smoke Control Panel (FSCP)

- 11.05-1 A FSCP is required for Fire Department emergency response purposes. The FSCP shall have the highest priority control over all smoke-control systems and equipment, whether or not the Automatic Fire Alarm System has been activated. The panel shall be designed to enable Fire Department personnel who may be unfamiliar with the specific system the ability to reconfigure the status of each smoke zone as deemed necessary during an emergency.
- 11.05-2 The Fire-fighter's Smoke Control Panel is a system that provides visual monitoring and manual overriding capability over smoke-control systems and equipment at designated location(s) within the building for the use by the fire department. This is also referred to as the Fire Fighters' Smoke-Control Station (FSCS) in NFPA 92A.
- 11.05-3 The panel is not approved separately. Its features and functions are integral to the smoke control system and fire alarm system. Therefore the panel layout must be included in both permit submittals, in accordance with numbersheet 42b. A full-scale color representation of the FSCP must be submitted for final approval. Fire alarm submittals that add, alter or replace an existing FSCP must also include a full-scale color representation of the FSCP for review and approval.

11.05-4 When the fire-fighter's smoke control panel is located in an area that is not continuously occupied a smoke detector shall be provided within 15 feet of the panel (measured horizontally). This applies to all auxiliary panels and equipment that may be located remote from the FSCP.

11.05-5 This panel shall be in accordance with IBC Sections 909.12 and 909.16, and incorporate BFD standards listed in this section.

Exception: Non high-rise buildings utilizing a shaft only pressurization system are not required to comply with all sections of 11.05. (see submittal requirements 42d). Due to the reduced control requirements of the system, it is acceptable to incorporate the following features:

11.05-5.1. The Fire Alarm Panel must be a UL listed releasing type panel, a full UUKL panel is not required.

11.05-5.2. A simplified panel with graphic representation is required.

11.05-5.3. Fan control switches (On / Auto / Off) must be clearly arranged and depicted at the top of shafts as outlined in this section.

11.05-5.4. Indicator lamps must be provided depicting the status of each fan: On, Off, Fault.

11.05-5.5. Provisions for the weekly self-test as required in IBC Section 909.12 must be included in the design documents.

11.05-5.6. The 2-hour separation requirements must be complied with.

11.05-6 **Panel Colors.** The smoke control panel shall consist of a white background and generally depict significant smoke barriers (i.e. floors, shaft walls, exterior walls) by single black lines, appearing as a general section view of the building. The image shall sufficiently illustrate all smoke zones in the building without providing the level of detail common to architectural elevation or section views.

11.05-6.1. The indication and direction of air movement shall be shown with arrows of the following colors:

(1) Stair/Elevator shaft pressurization supply air: **BLUE**

(2) Building zoned smoke control exhaust shafts: **RED**

(3) Building zoned smoke control supply air: **GREEN**

11.05-6.2. Large smoke zones, such as atria or interconnected garage levels, shall be surrounded with a color-coded bold line. In general, garage zones shall be bounded by an **ORANGE** line, atria by a **PURPLE** line.

- 11.05-6.3. All text shall be on contrasting background with a minimum size and stroke equivalent to 12-point bold Sans Serif font (such as Helvetica). Marking pens and self adhesive labels are not acceptable for identification.
- 11.05-7 **Panel Equipment and Status Indicators.** The general location of each smoke control system component, including fans, ducts and dampers, that is controlled or annunciated by the panel shall be depicted on the panel.
- 11.05-7.1. Exhaust equipment shall be located on the left side and supply equipment located on the right side of the building image.
- 11.05-7.2. Fans, major ducts, dampers, stairwells, shafts and zoning within the building that are portions of the smoke control system shall be shown connected to their respective ducts or dedicated fans with clear indication of direction of airflow.
- 11.05-7.3. Identification (Text “PRV”) shall be provided to denote floors where standpipe hose connections are equipped with pressure-reducing valves (PRV’s).
- 11.05-7.4. The location and status (NORMAL/RUNNING/FAULT) of each fire pump shall be depicted on the panel. Lamps shall be WHITE/RED/YELLOW.
- 11.05-7.5. Indicators as required by IBC Sections 909.16.1-2 through 909.16.1-4 shall be individually provided for each monitored piece of equipment.
- Exception:** Where specifically approved by the BFD, such indicators may be combined to represent the cumulative condition of monitored components within a zone. For example, all fans within a zone are expected to be indicated with one set of lamps. All dampers and any monitored doors within a zone are expected to be on an alternate set of indicators.
- 11.05-7.6. Positive indication of OPEN/CLOSED/FAULT status is require for smoke/combination dampers that are part of a smoke control system and/or that are installed within smoke barriers separating smoke zones where either zone is served by the mechanical smoke control equipment.
- 11.05-7.7. Positive indication of ON/OFF/FAULT status is require for all fans that are part of a smoke control system.

- 11.05-7.8. Doors and dampers need only be monitored to indicate proper configuration for smoke control (i.e. open if need to be open; closed if need to be closed; both when applicable).
- 11.05-7.9. Automatic-closing doors in smoke barriers which separate active/active or active/passive smoke zones are required to be activated by system type detectors and close anytime mechanical smoke control is activated. Positive indication of open/closed status on the FSCP is not typically necessary, but must be provided when appropriate.
- 11.05-7.10. Self-closing doors, fire dampers and barometric dampers generally cannot be remotely controlled nor are they required for the proper operation of the smoke control system; therefore, need not be monitored.
- 11.05-7.11. Each zone shall be provided with a red smoke alarm indicator labeled AREA or CORRIDOR SMOKE (initiated by area smoke detection) and red waterflow alarm indicator labeled WATERFLOW (initiated by automatic sprinkler protection waterflow). The appropriate indicator shall be illuminated upon initiation of the respective alarm in the zone. Where multiple zones exist on a floor, the zone of alarm shall be clearly depicted on the panel. If required for clarity, such alarm zones shall be shown in a plan view of the floor on the smoke control panel.
- 11.05-7.12. The duct detector for pressurization fans shall have a single indication lamp near the fan/damper depiction. This shall be a yellow/amber lamp.
- 11.05-7.13. The panel shall be provided with a list in the upper right corner of the panel of all possible and potential initiating device categories as appropriate, including: AREA SMOKE, CORRIDOR SMOKE, DUCT DETECTOR, WATERFLOW, SPECIAL SYSTEM, HEAT DETECTOR, MANUAL STATION, POWER DISCONNECT. Each category shall be provided with a red indicator. The respective indicator is to be illuminated upon such an alarm event in the building.
- 11.05-7.14. A single white indicator shall be provided and labeled "SYSTEM NORMAL," in accordance with IBC Section 909.16.1-1. This indicator shall be illuminated at all times when monitored equipment is in normal status and all switches are in the Auto position. Illumination of this lamp shall be in addition to the indication of the status of each component.
- 11.05-7.15. Where pilot type lamp indicators are required, Light Emitting Diodes (LED's) may be used.

11.05-8 **System Activation**

- 11.05-8.1. Shaft pressurization shall be initiated upon activation of any monitored fire alarm device, including but not limited to manual pull stations, smoke/heat detection, sprinkler waterflow, etc.

- 11.05-8.2. On residential towers utilizing a sandwich system, typical tower floors should sequence as follows: a waterflow-first alarm on the event floor should initiate notification sequence and activate shaft pressurization and supply air to floors above and below only; subsequent corridor smoke detector activation should initiate corridor exhaust. Should the corridor detection activate first w/o waterflow, then it must activate shaft pressurization and the pressurization of the floor above and below.

Exception: If the design requires event floor exhaust to achieve the code required pressure differential, then the exhaust of the event floor must initiate automatically in sequence with pressurization of the floor above and below.

- 11.05-8.3. Waterflow detection devices serving multiple smoke zones and manual pull stations may not be used to initiate smoke control systems (exception: shaft pressurization only) since the smoke zone of origin is unknown. Subsequent activation of an automatic fire alarm initiating device (i.e. addressable smoke detector) within an active smoke control zone shall automatically configure the smoke control system appropriately.

- 11.05-8.4. Smoke detectors used for activation of ventilating equipment in accordance with IBC Section 909.20.6 shall be located outside the smoke proof enclosure served. Where the conditions outside the smoke proof enclosure preclude the installation of a smoke detector, a smoke detector shall be located inside the smoke proof enclosure within 5 feet of each affected entrance.

11.05-9 **Zone Controls.** Switches utilized for floor zone control shall be located on the left side of the building image.

- 11.05-9.1. Control capability provided in accordance with IBC Section 909.16.2 for each smoke zone utilizing the pressurization method of IBC Section 909.6 shall be via a single 4-position switch. Settings for this switch shall be in the following sequence: CLOSED / EXHAUST / AUTO / PRESSURE. When approved, superfluous positions may be eliminated if the smoke control system is not provided with such control in a zone.

- 11.05-9.1.1. The CLOSED position shall automatically close/shut-down the components within a zone, isolating that zone from all adjacent smoke zones.
 - 11.05-9.1.2. The EXHAUST position shall automatically posture the components within that zone, to create a negative pressure within the zone.
 - 11.05-9.1.3. The AUTO position shall be configured in accordance with IBC 909.16.3 (2).
 - 11.05-9.1.4. The PRESSURE position shall automatically posture the components within that zone to create a positive pressure within the zone.
- 11.05-10 **Garage Control.** A single 3 position switch shall be provided to operate the garage supply and exhaust fans. Settings for this switch shall be in the following sequence: GARAGE FANS ON / AUTO /OFF. Monitoring of garage system status shall be provided only if components are provided with emergency power.
- 11.05-10.1. The GARAGE FANS ON position shall serve to automatically posture the components of both the supply and exhaust system fans to on.
 - 11.05-10.2. The AUTO position shall be the normal operating position of the components. If the fire alarm system in the garage zone is in alarm the system shall automatically posture the components of both the supply and exhaust system fans to on.
 - 11.05-10.3. The OFF position shall serve to automatically posture the components of both the supply and exhaust system fans to off.
- 11.05-11 Shaft fan control switches shall be placed at the top of the associated shaft and the bottom where multiple injection fans are utilized.
- 11.05-12 Control systems for mechanical smoke control systems shall include end-to-end verification, i.e. positive confirmation of actuation, testing, manual override and the presence of power downstream of all disconnects (See IBC 909.12). For smoke control fans, the override switch on the smoke control panel shall show a fault condition when the power disconnect switch for the fan is in the OFF position, and that a trouble condition must be sent to the fire alarm monitoring agency.
- 11.05-13 Where multiple fans intended to operate simultaneously in smoke control mode serve a single smoke zone, a single switch shall be provided for simultaneous control of all associated fans. However, indication of each individual fan unit is required.
- 11.05-14 A single switch shall be provided on the panel to unlock all locking doors in accordance with IBC 403.12, IFC 509 and IBC Chapter 10. The switch shall be provided in the lower right corner of the panel.

11.06 Smoke Control Record Documents

- 11.06-1 The following items must be maintained current in the fire control room or other approved location for the life of the building: Items one and two must be submitted to and approved by BFD prior to the start of special inspections.
1. Approved control diagrams must be kept accessible in the Fire Control Room for the life of the building and must be updated when changes are made to the building.
 2. Plans showing the devices and equipment which make up the smoke control system. This will include control diagrams in accordance with IBC 909.15, all smoke barriers, applicable initiating devices, controllers, fire alarm control panel, fire-fighter's smoke control panel, facility temperature controls, control wiring or tubing, isolation valves, relays, doors, dampers, fans, all supervision devices.
 3. Every device must have a distinct identifying address. For purposes of this requirement, BFD will accept the detailed design drawings, provided all of the devices listed above are shown, and no extraneous equipment other than fire alarm devices.
 4. A detailed event matrix (each device must be identified by individual address exactly as it is shown on the control diagram plans above);
 5. Documents describing the proper operation and maintenance requirements of each component of the smoke control system, including fan curves for the smoke control fans in the building.
 6. Maintenance logs and quarterly testing logs;
 7. The approved smoke control Detailed Design Report;
 8. UUKL panel self-test printouts;
 9. The final special inspection report.
- 11.06-2 Changes as a result of final installation, testing, or a change to the system design must be documented in the special inspection report, prepared in accordance with IBC Section 909.18.8.3. Record drawings shall include an accurate depiction of risers, raceway, conduit, all wire runs, cable identification, conduit size, location of junction boxes, terminal boxes, sources of power, devices, sensors, equipment, controlled equipment (motor starters, fans, pumps, valves, dampers, etc.).

11.07 Equipment

Ref.: IBC 909, NEC- 700, NFPA 110

- 11.07-1 All smoke control system equipment shall be listed and labeled by Underwriters' Laboratories and/or approved by Factory Mutual or other

listing agencies as approved by Fire Department Official. Interconnecting equipment that has not been listed for interconnection, or the creation of components or system into a nonstandard unit that is not normally available from the manufacturer is not acceptable.

11.07-2 All smoke control system equipment shall be installed in accordance with its listing and manufacturer's recommendations.

11.07-3 **Wiring.** Stairwell and elevator hoistway pressurization equipment, control and power wiring, etc. are considered part of the emergency system and must comply with Article 700 of the National Electrical Code (NFPA 70). This includes the related control devices, power supplies, power and control wiring, and all associated electrical equipment. In addition to the requirements in the NEC, in particular 700.9 (C), all portions of the shaft pressurization system are required to comply with IBC Section 909, including 909.20.6.1. Rooftop penthouses are considered part of the building. **Protection of wiring and control systems located inside the building must extend from the emergency source of power to the protected devices or equipment.**

Bellevue Fire would deem the following designs to comply with the above noted integrity and survivability requirements. These are not the only methods of meeting the survivability requirements. The additional requirements of IBC 909 and NEC 700 must be complied with, including protecting the remaining equipment and ductwork by 2-hour fire-resistance-rated barriers.

1. **Concrete Cover:** Wiring shall be located within concrete slabs and walls when covered with a minimum of 2" of concrete.
2. **Dedicated Shaft/Enclosure Method:** Wiring shall be located in a separate, dedicated 2-hour fire-resistance-rated (FRR) enclosure.
3. **2-hour Wiring:** The use of 2-hour FRR wiring in conduit protected by automatic sprinklers and against vandalism and other adverse effects including falling equipment or debris. This can typically be achieved by securing conduit tight to building structural elements.
4. **Electrical Room Separation Method:** When smokeproof enclosure pressurization/ventilation power and control wiring is located within a 2-hour FRR electrical room, the emergency power supply (panel and associated raceway or busway) shall be separated by a 2-hour FRR fire barrier from the other systems within the room, on all levels.
5. **Stairwell/Elevator Shaft Method:** Wiring shall be located within the 2-hour FRR stairwell it is servicing, or possibly elevator shafts if L&I will allow, when routed such that it is adequately protected against vandalism and other adverse effects including falling equipment or debris and in accordance with IBC Chapter 7. This can typically be achieved by securing conduit tight to building structural elements.

6. **Fire Alarm Controlled Method:** When smokeproof enclosure pressurization/ventilation equipment is controlled by the fire alarm system, the power wiring will be allowed to be located in the 2-hour FRR fire alarm shaft. Panels, cabinets, etc. are not allowed to be placed in the shaft, only conductors.

Design proposals that do not conform to one, or a combination of the above methods will require submittal of an alternate materials, design and methods proposal. Alternate materials, design and methods of construction and equipment may be presented for review and approval by the Fire Marshal and Building Official. Any such proposal that does not comply with the above design methods, must demonstrate compliance with the provisions of NEC 700.9 (C) and IBC 909.1.

- 11.07-3.1. Smoke Control wiring and pressurization system wiring may be co-mingled with other emergency circuits in accordance with Article 700 of the NEC. However, the 2-hour FRR separation must still be provided for the co-mingled conductors.
- 11.07-3.2. The chosen method of conductor protection shall be depicted and described on associated electrical, architectural and fire alarm drawings.
- 11.07-3.3. All wiring associated with the smoke control system shall be fully enclosed within continuous raceways (IBC 909.12.1). This includes all fire alarm component wiring utilized for activation and/or control.
- 11.07-4 The emergency generator and transfer switches shall be in a separate room from the normal power transformers and switch gear. The rooms must feature 2-hour FRR construction. (Ref. IBC 403.10, IBC 909.11, NFPA 110-7.2).
- 11.07-5 **Marking and Identification.** All portions of the fire detection system that activate smoke control must comply with this section.
 - 11.07-5.1. All portions of the control system must be identified in the field in accordance with the National Electrical Code Article 700.9 as amended by the City of Bellevue. This includes all applicable junction boxes, control tubing, temperature control modules, relays, damper sensors, automatic door sensors and air movement sensors. All junction boxes and covers for the smoke control system (including all portions of the fire detection system which activate smoke control) shall be externally identifiable.
 - 11.07-5.2. **Emergency Systems.** All boxes and enclosures larger than 6 in.(150mm). by 6 in.(150mm) (including transfer switches, generators and power panels) for emergency circuits shall be permanently marked with an identification plate that is orange in

color so they will be readily identified as a component of the emergency circuit or system. All other device and junction boxes for emergency systems and circuits shall be orange in color, both inside and outside.

11.07-5.3. **Smoke Control Systems.** All boxes and enclosures larger than 6 in. (150 mm) by 6 in. (150 mm) (including transfer switches, generators and power panels) for smoke control power and circuits shall be permanently marked with an identification plate that is orange in color with a yellow diagonal stripe so they will be readily identified as a component of the smoke control circuit or system. All other device and junction boxes for smoke control systems and circuits shall be orange in color both inside and outside. Cover plates shall be orange in color with a yellow diagonal stripe. Raceways for stair and elevator pressurization system wiring shall be identified by labels or color coding and shall be visible at the time of inspection.

11.07-5.4. All initiating and monitoring circuits devices shall be labeled.

11.07-6 The requirements for the primary power supply shall apply to all auxiliary panels and equipment. These shall include: A dedicated circuit, marked at the electric panels location and the smoke control panel or auxiliary panels locations. All primary power conductors shall be physically protected.

11.07-7 Signaling Line Circuits or other data control circuits shall be arranged so that a short, ground or open fault within a smoke zone will not cause the loss of initiating devices, monitoring devices or building control devices in any other smoke zone of the protected premises.

11.08 Special Inspector Testing

Ref.: IBC 909.18

11.08-1 **Special Inspector Qualifications.** The City of Bellevue does not certify or list special inspection agencies (SIA) or special inspectors (SI). The qualifications for special inspector are described below:

Exception: Low-rise buildings equipped with shaft pressurization only smoke control systems may utilize a SI registered with either the Association of Air Balance Council (AABC), or National Environmental Balancing Bureau (NEBB) and experienced in engineered smoke control equipment or systems.

11.08-1.1 Smoke control special inspection qualifications are outlined in IBC Section 909.18.8.2 and 1704.14.2. Both sections indicate that agencies (rarely will a single entity have all of these qualifications as a single special inspector) shall have expertise in mechanical and

fire protection engineering and certification as an air balancer. The combination of persons, agencies or firms can vary, but the qualifications must include all of the disciplines prescribed.

- 11.08-1.2 Agencies serving as the SIA must have a Washington State Registered (P.E.) overseeing the special inspection process. The combination of persons, agencies or firms can vary, but the qualifications of the team providing special inspections must include at a minimum all of the disciplines prescribed in IBC 909.18.8.2. Individuals conducting the actual testing are not required to be a registered P.E., nor is the P.E. required to be present for all testing. However, the P.E. is required to provide a certificate of compliance in accordance with this document.
- 11.08-1.3 Individuals serving as the SI shall be a Washington State Registered (P.E.) Fire Protection Engineer, Mechanical Engineer or Electrical Engineer with the qualifications outlined in IBC Section 909.18.8.2, or a P.E. with smoke management commissioning experience may serve as the SI to coordinate and verify all components of the smoke-control system within his or her area of expertise. The SI is required to provide a certificate of compliance in accordance with this document.
- 11.08-1.4 The P.E. who prepared the rational analysis and Detailed Design Report may serve as the SI.
- 11.08-1.5 The vendor, technician, installing contractor or air balancer cannot serve as the SI.
- 11.08-1.6 All airflow and pressure testing must be done by an approved Associated Air Balance Council or National Environmental Balancing Bureau agency. If this company is hired by the installing contractor or responsible for the balancing of the system, the SI must witness all required special inspection testing.
- 11.08-2 **Special Inspection and Test Requirements.** Each smoke control system shall be inspected and tested in accordance with IFC 909.3, 909.10 through 909.19, Chapter 8 of NFPA 92A, ASHRAE Guideline 5, and as described in this section. In particular, the following is a partial list of items that must be tested:
- Every fire alarm initiating device which activates any portion of the smoke control system must be verified to provide all applicable output functions in accordance with IBC 909.18.7. Each detection device must also be tested in accordance with 909.18.1.. Where testing would result in the repeated start and stop of large fans, such fans may be disabled or bypassed provided that verification that the proper system output to the fans is transmitted during testing while the FSCP is constantly attended. Proper operation of disabled equipment shall be restored

and demonstrated upon receipt of an actual alarm event, or at the conclusion of the testing period, whichever occurs first.

- Power systems shall automatically transfer to full standby power within 10 seconds of failure of the primary power per COB Ordinance.
- Smoke Barrier construction shall be evaluated in accordance with IBC Section 909.5 requirements.
- The pressure difference across door shall not exceed a 30-pound force to set the door in motion in accordance with IBC Section 1008.1.2.
- Pressurized shafts shall have a positive pressure relative to the building, including where a shaft opening exists to a pressurized zone, measured with all stairway doors closed under maximum anticipated stack pressures.

11.08-2.1 A written Special Inspection Test Procedures document shall be prepared by the SI/SIA and submitted to the Fire Department for review and approval as part of the Detailed Design submittal, prior to the actual testing. As a minimum, these documents must provide a detailed method of testing and documenting the pass/fail criteria of each test demonstrating that the electrical components of the smoke control system functions as intended by the design.

11.08-2.2 The SI/SIA must conduct the acceptance testing and inspection prior to requesting System Commissioning Testing by the Bellevue Fire Department.

11.08-2.3 The vendor, or a technician certified by the vendor, shall design, supervise, program and commission the installed system controls. The system should be pre-tested by the installing contractor prior to testing witnessed by the special inspector. The installer and a trained technician for the FSCP shall be present for all special inspector testing.

11.08-2.4 The Special Inspection Agency must be provided with the approved smoke control Detailed Design Report, the Special Inspection Test Procedures, the control diagrams, and the approved smoke control permit plans.

11.08-3 **Certificate of Compliance by the Special Inspector.** A certificate of compliance must be provided by the special inspector certifying that the referenced property is in substantial compliance. The certificate shall identify the company and special inspector that performed the testing, name, date and address of the property being tested. The following statement must also be included:

"I have reviewed the report and by personal knowledge and on-site observation certify that the smoke control system is in substantial compliance with the approved design documents, and to the best of my understanding complies with requirements of the applicable codes as identified in the smoke control report."

11.09 System Commissioning by the Bellevue Fire Department

Ref.: IBC 909.19

- 11.09-1 Commissioning acceptance testing shall be completed in accordance with Special Inspector Testing above, and this section.
- 11.09-2 Prior to system commissioning by the City of Bellevue, a report shall be provided as described in IFC Section 909.18.8.3.1. This report shall also identify any remaining system deficiencies.
- 11.09-3 The SI/SIA will arrange for system commissioning by the Bellevue Fire Department, Fire Prevention Division, to include witnessing a final contractor executed operational and performance test of the system. The SI Test Procedures shall be referenced with regard to methodology for testing selected system components and features. All testing shall be conducted in accordance with approved standards and observed by the Fire Prevention Officer.
- 11.09-4 **Pressurization Methods** (IBC Sections 909.6, 909.6.3 or 909.20): For a smoke control system serving a typical high-rise tower, the testing must demonstrate proper system operation and performance in no fewer than 3 smoke zones and a minimum of 10% of the building's smoke zones. Smoke zones will be selected at the Fire Prevention Officer's discretion and are generally intended to evaluate conditions at or near the bottom, middle and top of a tower; every pressurized shaft shall be evaluated. Proper system function is demonstrated by achieving stated performance criteria. Smoke control system features to be evaluated during system commissioning include:
1. Visual observation of elements described in Sections 11.04 and 11.06 above, including proper annunciation of system normal status except for deficiencies identified with Section 11.08-02 above and system configuration upon testing of select smoke-control zones.
 2. Visual observation of smoke barriers in select smoke-control zones for absence of obvious deficiencies.
 3. Proper function of smoke control system in select smoke-control zones, including a minimum of 1 of each initiating device serving the zone (i.e. smoke detector, waterflow switch, manual station) and sequence of operation. Required pressure differentials across smoke barriers and maximum door opening forces must be demonstrated.
 4. Manual control of smoke control system equipment serving select smoke-control zones shall be demonstrated.
 5. Proper function of any smoke control fan equipment via automatic initiation and manual control if not observed during evaluation of select smoke-control zones.

- 11.09-5 **Exhaust or Airflow Method** (IFC 909.7 or 909.8): Atria or other spaces utilizing the exhaust and/or airflow method. The testing must demonstrate proper system operation and performance of 100% of the smoke control equipment. Smoke control system features to be evaluated during system commissioning include:
1. Visual observation of elements described in Sections 11.04 and 11.06 above, including proper annunciation of system normal status except for deficiencies identified with Section 11.08-02 above and system configuration upon testing of smoke-control zones.
 2. Visual inspection of associated smoke barriers for absence of obvious deficiencies.
 3. Proper function of smoke control system, including a minimum of 1 of each initiating device (i.e. smoke detector, waterflow switch, manual station) and sequence of operation. It shall be demonstrated that airflow toward the fire does not exceed 200 feet per minute, per IFC Sections 909.7.2 and 909.8.1.
 4. Manual control of smoke control system equipment shall be demonstrated.
- 11.09-6 Other smoke control systems or features shall be evaluated as requested by the Fire Prevention Officer based on the approved design and installed condition to demonstrate proper operation of the smoke control system and features.
- 11.09-7 Testing involving chemical smoke or a tracer gas can be used for tracer test during acceptance testing to visually verify air movement.
- 11.09-8 If any smoke control system deficiency not identified in the Acceptance Testing Report discovered during system commissioning, system commissioning may be ceased at the Fire Prevention Officer's discretion until such time as testing in accordance with Section 11.08 above can be repeated as necessary to resolve the deficiency and a revised report is submitted in accordance with this Section.
- 11.09-9 **Certificate of Compliance by the Designer.** Upon completion of the commissioning report, IBC Section 909.18.8.3 requires the responsible registered design professional to review the report. When satisfied that the smoke management system has been properly inspected and tested and meets the acceptance criteria, the design professional must affix his or her seal and sign and date the report. They must also include the following statement:
- "I have reviewed the report and by personal knowledge and on-site observation certify that the smoke-control system is in substantial compliance with the design intent and to the best of my understanding complies with the requirements of the code."*

11.10 Periodic Testing

Ref.: IFC 909.12, 909.20

- 11.10-1 **Routine Maintenance and Testing.** The system must be maintained in accordance with the manufacturer's instructions and IFC sections 909.20.1 through 909.20.5.
- 11.10-2 **Automatic Weekly Self-Tests** must be conducted and documented for smoke control systems (IBC 909.12). Such testing must include positive confirmation of actuation. The fire alarm or smoke management panel shall exercise system components once per week and receive positive confirmation that the component operated properly. For fans, the self-test typically involves turning on the fan just long enough to bring them up to speed and receive positive confirmation of airflow. For dampers, the self-test typically involves cycling the damper into both the open and closed positions and receiving positive confirmation of each position via contact switches. The duration of the self-test shall be adequate to allow the system to detect a fault condition in the event an affected system component did not function properly.
- 11.10-1.1. During the self-test, should any devices malfunction, a visible and audible signal shall be displayed at the Fire-fighter's smoke control panel and a trouble signal shall be transmitted to the fire alarm monitoring agency. The self-test procedure and output shall be printed and maintained in the fire control room and accessible to inspection agencies.
- 11.10-1.2. The system must demonstrate that upon initiation of an alarm, it will properly abort the self-test and initiate the programmed smoke control sequence of operation.
- 11.10-3 The routine maintenance and operational program described in IFC Section 909.20 shall be stored in the FCC. Periodic testing shall reference these materials. If required documents are not present, they shall be developed for approval in accordance with Information Sheet 42C.
- 11.10-4 The written record described in IFC Section 909.20.2 shall be maintained with the routine maintenance and operational program in reverse chronological order, beginning with the most recent completed report. The record shall minimally include copies of completed BFD Smoke Control System Confidence Test Report forms together with the associated Cover Sheet.
- 11.10-5 Periodic testing shall be performed by qualified service technicians who are familiar with the proper operation of the smoke control system and equipment. Periodic testing involves manipulation of FSCP manual override controls; care must be exercised to avoid creating conditions harmful to life or property. The intent of this testing is to ensure that the

system will function as designed during an emergency, not to challenge the integrity of the system.

- 11.10-6 Operational testing associated with periodic testing need not include the measurement of pressure differentials or airflow quantities. Pressure differentials and airflow quantities shall be observed as required for Performance Testing. Performance Testing shall be performed in accordance with the Special Inspector Test Procedures based on the Detailed Design Report. If these documents are not present, they shall be developed by the SI/SIA for approval in accordance with Information Sheet 42C.
- 11.10-7 The BFD Fire Protection System Confidence Test Report Cover Sheet and Test Report Form shall be completed and submitted for each Operational or Performance Test.
- 11.10-8 **Operational Testing** of smoke control systems for “each control sequence,” shall minimally include the following:
1. System activation by manual control via FSCP while the system is in normal status; may result in transmission of trouble signal to FACP.
 2. Trouble signal transmitted to FACP when FSCP manual control set to Off or Closed position while system is in normal status.
 3. System operation by automatic means via a minimum of 1 of each type of initiating device (i.e. smoke detector, waterflow switch, manual station) and sequence of operation serving each smoke-control zone.
 4. Manual control via FSCP when system is active to activate inactive system components and disable active system components. Manipulation of the system to achieve each possible combination of switch configurations need not be demonstrated. However, proper manual override capability shall be demonstrated for each switch.
 5. Return all override switches to their "Auto" position.
- 11.10-9 **Performance Testing** shall be conducted in accordance with applicable sections of the SI Test Procedures by a qualified individual and witnessed by a SI/SIA as described above. Periodic Performance Testing shall occur as follows:
1. For each building or tower with a pressurization system or pressurized shafts, conduct Performance Tests, including observations and measurements of all aspects of the smoke control system, as described under Operational Testing Items 1-5, at a minimum of 3 locations: a smoke control zone in the lower third, a floor in the middle third and a floor in the upper third of the

building and/or tower served by each shaft. Performance Tests in subsequent years shall be conducted on previously untested floors, as is practical so that all floors ultimately are tested in a cycle.

2. For each exhaust or airflow system, conduct Performance Tests, including observations and measurements of all aspects of the smoke control system, as described in Operational Testing Items 1 through 4.
3. For all other systems, conduct Performance Tests, observations and measurements of all aspects of the smoke control system at a minimum number of locations to demonstrate proper performance as approved by the BFD. Each test shall attempt to involve as many different fan systems as practical. Performance tests in subsequent years shall be conducted on previously untested locations, as is practical so that all locations ultimately are tested.
4. For each sequence of operations, visually confirm that controlled components in associated active zones have assumed the correct operating condition for the type of alarm initiating device and the location of initiating device. Proper annunciation shall be confirmed also at the FSCP.
5. Manually override the operation of a sampling of fans and/or dampers during each test, taking care not to damage system components.
6. During at least one test, for buildings requiring elevator recall, confirm that the elevators return to the designated return floor and perform as required.
7. Return all override switches to their "Auto" position.
8. SI/SIA shall immediately notify the City of Bellevue in writing and call 425-452-6872 weekdays (except holidays) from 8 am to 5 pm, or 911 outside these hours, whenever it is determined that a smoke control component or system is inoperable and is creating a life threatening situation.
9. The SI/SIA shall give written notice to the owner of any deficient or non-complying smoke control system feature that is discovered is not corrected prior to the end of the day. All deficient or non-complying aspects shall be corrected.

11.10-10

Where Operational or Performance Testing would result in the repeated start and stop of large fans, such fans may be disabled or bypassed provided that verification that the proper system output to the fans is transmitted during testing while the FSCP is constantly attended. Proper operation of disabled equipment shall be restored and demonstrated upon receipt of an actual alarm event, or at the conclusion of the testing period, whichever occurs first.

- 11.10-11 SI/SIA shall submit a Confidence Test Report to address the results of Performance Testing within 30 days of completion of the testing or date that a deficiency or non-complying condition, which has not been corrected, was discovered. The Confidence Test Report shall clearly identify any unresolved issues, and include:
1. Executive Summary of smoke control design methodology
 2. Documents Reviewed
 3. Passing Criteria
 4. Testing Scenarios
 5. Inspection and Testing Report
 6. Statement of Compliance
- 11.10-12 Dampers controlled by the smoke control system, whether monitored by the FSCP or not, shall be visually inspected and maintained a minimum of every 4 years in accordance with NFPA 90A and the manufacturer's recommendation.
- 11.10-13 Fire alarm system testing may coincide with periodic testing, except that each dedicated smoke control system component shall be manually exercised at least semi-annually.
- 11.10-14 **Ongoing Records of System Testing and Inspection** described in IFC 909.20 shall be maintained in the FCC or other approved location for review upon request by the City of Bellevue as described below:
- 11.10-14.1 Ongoing records shall minimally serve to document the date of each inspection, the focus of each inspection, and the results.
- 11.10-14.2 Elements of the smoke control system found to not conform to the detailed design report or testing program shall be clearly identified as to what the issue is, the date it is discovered, how it was resolved and the date it is resolved (if applicable).

CONCEPTUAL SMOKE CONTROL SUBMITTAL

06/12/08

The city may require additional information as needed. For preparation information, see description sheet # 1, *Standards for Plans and Drawings*. If you have any questions concerning your application, please visit or call Permit Processing (425-452-6800) between 8 a.m. and 4 p.m., Monday through Friday (Wednesday, 10 to 4). Assistance for the hearing impaired: dial 711 (Telecommunications Relay Service).

Because of the complexity of smoke control systems, it is important that design documents incorporate the conceptual smoke control approach as early as possible during the design process.

Locations that may require smoke control systems include (IBC 2006 reference):

- Pressurized Shafts/Smokeproof Enclosures(1020.1.7)
- Underground Buildings (405.5)
- Windowless Buildings (408.8)
- Covered Mall Buildings (402.9)
- High-rise Buildings (403.13)
- Building Atriums (404.4)
- Stages and Platforms (410.3.7.2)
- Assembly Seating (1025.6.2.1)

To apply for the building or TI permit where smoke control (including shaft pressurization only systems) is provided, documentation consisting of the following is required. **This submittal checklist must be completed and submitted with the application. Submit 2 sets of documents**

- The Conceptual Smoke Control Design must be prepared by a Professional Engineer competent in the design of smoke control systems and accompanied by current architectural background drawings and Smoke Zone Plans.
- The Conceptual Smoke Control Design is the first submittal of the Smoke Control Permit (type FH) and must be submitted as a separate permit prior to the Building permit.
- The Conceptual Smoke Control Design must be approved prior to release of the building permit, or submittal of the detailed design (number sheet 42b)

The submittal must include:

- A Summary Event Matrix** (sequence of operations) for the smoke control system.
- Smoke Zone Plans** at a legible scale (these may be part of the drawing set) identifying smoke zone boundaries and smoke barrier locations. Depict (cross hatching, coloring, etc.) the smoke control approach for each space, such as active (indicate mechanical supply and/or exhaust capability), passive (indicate if vents are provided), or sub-zones (spaces not constructed as a smoke compartment and not provided with smoke control).
- A Life Safety Report** must be submitted as part of the conceptual design. This report must include a project description of the building, life safety systems and the smoke control system. Calculations/computer modeling analysis need not be provided with the conceptual design.
 - Life Safety Systems.** This report must include a description of the building, occupancies and various life safety features of the project (sprinkler systems, fire pumps, reservoirs, standpipe systems, fire detection/alarm/communication system, Fire Command Center requirements, emergency power systems, in-building radio system, etc.) and how they will interface with each other.

- **The Smoke Control Narrative** must detail how the code requirements of IBC 909 will be addressed including the design constraints and limits. It must also clearly describe each space identified on the Smoke Zone Plans, in sufficient detail to describe the smoke control method for each space and how it would be initiated. In particular:
 - System performance goals and design objectives, including general testing criteria.
 - Specific performance criteria to be evaluated for each zone.
 - Location of fire-fighter's smoke control panel.
 - Description of the firefighter smoke control panel features.
 - Description of the 2-hour protection of pressurization fan wiring, equipment and ductwork.
 - Location of pressurization fans.
 - Identified design constraints.
 - Identification of spaces where computer modeling is planned.
 - Design basis fire(s) and locations.
 - Tenability criteria.

Conceptual design documents need not include calculations or detailed control diagrams, but must generally identify every smoke zone in the building and the smoke control approach for each zone. Approved smoke control approaches are described in City of Bellevue Fire Department Development Standards (BFDDS), Chapter 11-Smoke Control.

Approval of the Conceptual Design Submittal **does not** constitute approval of the smoke control system. Once the conceptual design submittal has been approved, the Detailed Design Submittal as described in City of Bellevue Submittal Requirements Guide 42b must be submitted.

Remodeling or tenant improvement (TI) projects that affect the performance of an **existing** smoke control system, or require the addition of a smoke control system, must satisfy the conditions described in this guide, 42a.

Where a **New** smoke control system is required, see Guide 42b. For **Revisions to an Existing** smoke control system, see Guide 42c. For **Shaft Pressurization Only** systems, see Guide 42d.

To apply for future permits for associated systems (Building, Mechanical, Electrical, Sprinkler, and Fire Alarm), the following details must be included in those submittals. These details and permits are not part of the 42a submittal requirements:

1. Architectural Plan Submittal:

- A Concise Narrative Description of the smoke control system and any special requirements of the design must be prepared by the author of the Detailed Design Report. This description will be required to be on every set of associated design plans and be shown on future tenant improvement drawings for the life of the building as described in Sheet 42c.

- Clear identification where passive zones and active zones are provided.
- Clear identification of the smoke zone boundaries. These boundaries are required to be constructed as smoke barriers and must be appropriately identified, including wall and/or horizontal listed assembly number and associated assembly details not deviating from the listed assembly..
- A letter prepared by the architect stating that their design satisfies the requirements of the smoke control system. Note: a single letter signed by all disciplines is acceptable.
- Plans must provide the location and design of the emergency generator and transfer switch rooms per IBC Section 909.11. In addition, they must detail 2-hour fire-rated separation of power/control wiring to equipment serving the pressurized elevator and stair shafts.
- Provide seismic anchorage of critical systems and include the design with the associated design submittal, as appropriate (IBC Section 403.14).

2. Mechanical Plan Submittal:

- A Concise Narrative Description of the smoke control system and any special requirements of the design must be prepared by the author of the Detailed Design Report. This description will be required to be on every set of associated design plans and be shown on future tenant improvement drawings for the life of the building as described in Sheet 42c.
- Clear identification where passive zones and active zones are provided.
- Clear identification of the smoke zone boundaries. These boundaries are required to be constructed as smoke barriers and must be appropriately identified.
- A letter prepared by the mechanical designer stating that their design satisfies the requirements of the smoke control system. Note: a single letter signed by all disciplines is acceptable.
- Plans must include identification of the location and address of all devices that will initiate shaft pressurization, components associated with the smoke control process (including actuators, control dampers, fire and smoke dampers, variable air volume controls, and fans), and associated system responses/configurations.
- Provide capacities of each shaft pressurization fan—including applicable calculations for the number of belts and the operating exhaust temperature.
- Identify equipment locations with inlet and outlets clearly identified and separated in accordance with Amended IBC Section 909.10.3.
- The location and design of the emergency generator and transfer switch rooms per IBC Section 909.11.

3. Fire Alarm Plan Submittal:

- A Concise Narrative Description of the smoke control system and any special requirements of the design must be prepared by the author of the Detailed Design Report. This description will be required to be on every set of associated design plans and be shown on future tenant improvement drawings for the life of the building as described in Sheet 42c.
- For final approval, Fire-fighter's Smoke Control Panel must be submitted in color at full-scale for Fire Department review with the fire alarm plans.
- A letter prepared by the fire alarm designer stating that their design satisfies the requirements of the smoke control system. Note: a single letter signed by all disciplines is acceptable.
- Plans must include identification of the location and address of all devices that will initiate smoke control, components associated with the smoke control process (including actuators, control dampers, fire and smoke dampers, variable air volume controls, and fans), and associated system responses/configurations.
- Submittals must also demonstrate the 2-hour fire-rated protection of wiring, when utilizing the fire alarm system for pressurization control functions.

4. **Electrical Plan Submittal:**

- A Concise Narrative Description of the smoke control system and any special requirements of the design must be prepared by the author of the Detailed Design Report. This description will be required to be on every set of associated design plans and be shown on future tenant improvement drawings for the life of the building as described in Sheet 42c.
- Clear identification where passive zones and active zones are provided.
- Clear identification of the smoke zone boundaries. These boundaries are required to be constructed as smoke barriers and must be appropriately identified.
- A letter prepared by the electrical designer stating that their design satisfies the requirements of the smoke control system. Note: a single letter signed by all disciplines is acceptable.
- The location and design of the emergency generator and transfer switch rooms per IBC Section 909.11.
- Generator sizing and minimum run time of the generator for evacuation purposes.
- Demonstrate 2-hour protection of wiring controlling/powering fans serving smoke proof enclosures.
- Panel schedule (industry standard type) for the emergency panel with connected and demand loads.
- Schedule of smoke control components showing equipment, the load in amps or volt-amps, conduit type and size, conductor type and size, and breaker type and size.
- All emergency system wiring methods pertaining to the smoke control.
- Schedule of individual smoke control components starting loads that will start at the same time and schedule of individual smoke control components running loads.
- The total combined loads of smoke control components for start up and run (start up and run shown separately).

5. **Sprinkler Plan Submittal:**

- A Concise Narrative Description of the smoke control system and any special requirements of the design must be prepared by the author of the Detailed Design Report. This description will be required to be on every set of associated design plans and be shown on future tenant improvement drawings for the life of the building as described in Sheet 42c.
- Clear identification where passive zones and active zones are provided.
- Clear identification of the smoke zone boundaries. These boundaries are required to be constructed as smoke barriers and must be appropriately identified.
- A letter prepared by the sprinkler designer stating that their design satisfies the requirements of the smoke control system. Note: a single letter signed by all disciplines is acceptable.
- Demonstrate that sprinkler zones are coordinated with smoke zones, as applicable.

Detailed Smoke Control Submittal

06/12/08

The city may require additional information as needed. For preparation information, see description sheet # 1, *Standards for Plans and Drawings*. If you have any questions concerning your application, please visit or call Permit Processing (425-452-6800) between 8 a.m. and 4 p.m., Monday through Friday (Wednesday, 10 to 4). Assistance for the hearing impaired: dial 711 (Telecommunications Relay Service).

Because of the complexity of smoke control systems, it is important that the design documents clearly identify the expected performance of the system. These documents must also clearly identify the expected performance of *each component* in the smoke control system. Components include all passive and active elements that work together to provide smoke control in accordance with International Building Code (IBC) Section 909.

To more clearly identify the systems involved on design plans, the background systems and floor plans should be in light line weight, with the pertinent systems in heavy line weight. Smoke control system component drawings shall be submitted on current architectural backgrounds.

To obtain the smoke control permit, documentation containing the following details/ specifications is required. **This submittal checklist must be completed and submitted with the application. Submit 2 sets of documents.**

1. Detailed Design Report (including the smoke control system rational analysis)- based on the conceptual design report, must be prepared by a Professional Engineer competent in the design of smoke control systems.
 - The Detailed Design Report must be a bound document, independent of design plans, and minimally include the following:
 - The signature, date and stamp of the professional engineer responsible for the rational analysis/design.
 - General narrative description of the building. This description will include identification of building uses and occupancies as well as passive and active fire protection features that will work together with the smoke control system.
 - Narrative description of each passive and active smoke zone. Every space in a building requiring smoke control must be identified as an active or passive smoke zone, with measurable performance criteria identified. This description will include such items as:
 - Description of which methods will be used for each active smoke-control zone, and supporting rational analysis in accordance with IBC Section 909.4. This description will include such items as minimum required fan size, expected fire loads, ceiling heights, computer modeling, calculations, locations of operable windows and/or doors, etc.
 - Specific discussion of how smoke control will be initiated in each zone and the associated system responses. Provide a simple and clear event matrix.
 - The sequence of operations (including timing, if necessary, to provide for proper door operation or prevent duct implosion or rupture) and the positioning of each damper for every fire scenario.
 - Measurable performance criteria for each shaft.
 - Description of smoke dampers and fire/smoke dampers, including which dampers will be supervised for damper position, the position of unsupervised

dampers when smoke control system is active, damper positions upon loss of power, actuation temperature of fire and fire/smoke dampers.

- Calculations associated with the smoke control system design including addressing wind, stack and temperature effects (IBC 909.4.1 – 909.4.6).
- Computer Modeling such as CONTAM
- Fan capacity calculations and belt requirements.
- Identification of the anticipated system performance, especially with regard to pressurized stairwells/hoistways, during stack effect conditions. Provide calculations demonstrating minimum and maximum pressure differentials to be observed during and in the absence of any stack effect.
- Description of smoke dampers and fire/smoke dampers, including which dampers will be supervised for damper position, the position of unsupervised dampers when smoke control system is active, damper positions upon loss of power, actuation temperature of fire and fire/smoke dampers.
- Identification of coordinated zones for sprinkler and fire alarm systems with regard to smoke control zones.
- Identification of where variable frequency drives are to be used for smoke control equipment and method of control.
- The piston effect of elevators.
- Description of fire modeling or other performance-based analysis utilized in the design of the smoke control system. The purpose of the analysis as well as associated assumptions and conclusions must be clearly identified.
- Any related material that supports the design of the smoke control system.
- The signature and stamp of the professional engineer responsible for the rational analysis.
- Calculations associated with the system design and fan capacities.
- Description of how the periodic self test required in IBC Section 909.12 will be accomplished.

2. Detailed Event Matrix / Sequence of Operations- must include:

- Every initiating device by address down one column.
- Every smoke control device (i.e. fans, dampers, etc.), and every other event that must occur in order for proper operation of the smoke control system (i.e. HVAC shutdown, etc.) across the top; with prior approval, some devices may be combined.
- Design submittals must include the sequence of operations (including timing, if necessary, to provide for proper door operation or prevent duct implosion or explosion) and the positioning of each damper for every fire scenario.

3. Drawings- The following drawings must be included in a drawing package designated as "Smoke Control System" to differentiate them from any other plans for that job or project:

- To clearly identify the smoke control systems, the background systems and floor plans should be in light line weight, with the pertinent systems in heavy line weight.
- Smoke control system component drawings shall be submitted on current architectural backgrounds.
- Smoke control zone drawings clearly identifying (colored, hatched, etc.) the active smoke control zones.
- Drawings identifying the fire rating of associated smoke barriers.
- Location of fire-fighter's smoke control panel/controls, and room layout.
- The fire-fighter's Smoke Control Panel must be submitted, depicting fan/damper controls and status indication as per Fire Department Development Standard Chpt. 11. For final approval, Fire-fighter's Smoke Control Panel must be submitted in color at full-scale for Fire Department review with the fire alarm plans.
- Smoke control mechanical equipment and ductwork drawings.
- Control diagrams must be provided as referenced by IBC Section 909.15.
- Location and design of the emergency generator and transfer switch rooms per IBC

Section 909.11.

- Drawings demonstrating all emergency system wiring methods associated with the pressurization system, from the source (generator) to the device (damper, fan, etc).
 - Drawings must clearly demonstrate pressurization control and power wiring routing and 2-hour. protection.
 - Drawings must clearly demonstrate fire alarm wiring routing and 2-hour protection when used to control the pressurization system.

- 4. A Special Inspector Test Procedures document must be submitted with the smoke control permit in accordance with IBC Section 909.3, and as described in City of Bellevue Fire Department Development Standards, Chapter 11.
 - The architect, engineer of record or special inspector must prepare this as a bound document, independent of the design plans and smoke control report, and minimally address the following:
 - Qualifications of the special inspector and special inspection agency.
 - Summary of the testing to be performed, including:
 - A general description of each smoke control component and zone to be evaluated, and
 - The applicable performance criteria as identified in the smoke control report and IBC Section 909.18.
 - Each of the testing requirements outlined in IBC 909.18.1 - . 9.
 - Provide representative test forms and inspection reports that will be used.
 - Anticipated testing schedule, minimally addressing IBC Section 909.18.
 - If testing will occur in absence of stack effect (with similar interior and exterior temperatures) the procedures must identify the range of acceptable test pressures to ensure system pressures will be maintained in the presence of anticipated stack effect.
 - Method of testing of passive barriers, such as door fan testing. The special inspection program must include the random testing of an approved percentage or quantity and distribution of passive smoke zones. Where multiple passive zones exist on multiple floors, such as residential units, a minimum of 1 unit per floor and a maximum of 10 percent per floor must be evaluated, whichever is greater, unless otherwise approved.
 - Every fire alarm initiating device which activates any portion of the smoke control system must be tested to verify all applicable output functions in accordance with IBC 909.18.7.

Note: Approval of the smoke control system *does not* constitute approval of each component system. Separate fire alarm, sprinkler, building, mechanical, and electrical approvals are required.

Smoke Control System Revisions

06/12/08

The city may require additional information as needed. For preparation information, see description sheet # 1, *Standards for Plans and Drawings*. If you have any questions concerning your application, please visit or call Permit Processing (425- 452-6800) between 8 a.m. and 4 p.m., Monday through Friday (Wednesday, 10 to 4). Assistance for the hearing impaired: dial 711 (Telecommunications Relay Service).

Because of the complexity of smoke control systems, it is important that the design documents clearly identify the expected performance of the system. These documents must also clearly identify the expected performance of each component in the smoke control system. Components include all passive and active elements that work together to provide smoke control in accordance with International Building Code (IBC) Section 909.

Projects subject to this guide may include those involving:

- Additions or alterations to existing buildings affecting the use, occupancy, or leakage area of one or more smoke-control zones
- Adding, removing, or altering the location of smoke barriers or openings therein
- Adding, removing, or replacing equipment serving the smoke control system, including dedicated or non-dedicated fan equipment
- Adding, removing, replacing, or altering devices or systems that are capable of affecting the function of the smoke control system, including fire alarm detection devices

Where a new smoke control system is required by additions or alterations to an existing building, see Guide 42b.

To more clearly identify the systems involved, the background systems and floor plans should be in light line weight with the pertinent systems in heavy line weight.

To obtain the smoke control permit, documentation containing the following details/ specifications is required. **This submittal checklist must be completed and submitted with the application. *Submit 2 sets of documents.***

- The detailed design report for the existing building condition must be referenced to identify the effects of the project on the smoke control system. In the absence of this information, the apparent smoke control approach for the entire building and the existing smoke control sequence of operation for the affected zones must be identified and described by a Professional Engineer competent in the design of smoke control systems.
- A Concise Narrative Description of the smoke control system and any special requirements of the design must be provided. This description will be required to be on every set of associated design plans and be shown on future tenant improvement drawings for the life of the building as described in Sheet 42c.
- When the project would result in deviation from the original Detailed Design Report or concise narrative description, an updated smoke control system rational analysis must be performed in

accordance with IBC Section 909.4 and must be prepared by a Professional Engineer (P.E.) competent in the design of smoke control systems. This analysis must be stamped by the P.E. and address all modified and affected smoke zones, and update the detailed design report and concise narrative description.

- The Architect of Record, Mechanical and Electrical Engineers of Record, and fire alarm and sprinkler system designers for the project must sign the smoke control system design documents that they prepared. If the rational analysis was prepared by another party, each designer must provide written documentation that they have read and incorporated the rational analysis in their design, such as by a written statement on the record drawings.
- If the project resulted in deviation from the concise narrative description or detailed design report, the author of the updated detailed design report or concise narrative description must review design documents pertaining to the smoke control system when prepared by others and provide a letter identifying that the design complies with the smoke control system requirements.
- Indicate on the design plans the location of all (new and existing) devices that will initiate smoke control, devices involved in the smoke control process (including actuators, control dampers, fire and smoke dampers, variable air volume controls, and fans), and identification of devices provided with emergency power.
- Provide smoke-control zone drawings that clearly identify the existing configuration of affected active and passive smoke-control zones.
- Provide smoke-control zone drawings that clearly identify the configuration of active and passive zones after completion of the project. Sprinkler zones must be coordinated with smoke zones.
- Identify the smoke control method being used for each affected smoke-control zone, including applicable calculations (supporting analysis utilizing computational fluid dynamics (CFD) or a network flow analysis may be required), and identify unique or unusual fire loads.
- Provide details of each new fan involved in smoke control, including its capacity, the number of belts and wiring for power, control, and monitoring. Where an existing fan is replaced, identify the existing fan operating capacity in smoke control mode.
- Provide the sequence of operations (including sequence of operations, if necessary, to prevent duct implosion or explosion) and updated performance matrix with the positioning of each damper for every fire scenario in each affected smoke control zone.
- Seismic anchorage of critical systems and include the design with the submittal (IBC 403.14).
- Identify modifications to electrical loads of the individual equipment associated with the smoke control system and confirm adequate capacity of associated emergency generator.
- Full-scale color illustration of Fire-fighter's Smoke Control Panel (FSCP), if revised or added.
- Where the project work is limited to modifications within an existing smoke zone, operational testing only is required to demonstrate appropriate system responses based on alarm sequences initiated in affected zones, as well as system responses in the affected zones based on alarm sequences initiated in adjacent zones. Manual control of equipment in affected zones via the FSCP must also be verified.
- When the project work adds, modifies, or replaces smoke control zones, barriers, or fan equipment, in addition to operational testing as described in Item 15, performance testing of the affected zones is required and a Special Inspector Test Procedure to evaluate the affected areas of the smoke control system in accordance with City of Bellevue Fire Department Development Standards

(BFDDS) Chapter 11. Performance tests shall minimally demonstrate satisfactory performance of the elements of the affected smoke-control zones. If variable frequency drive (VFD) settings are modified, tests must be performed as required in the modified area, and in adjacent areas served by previous fan speed to confirm proper pressures.

To incorporate all of this information, the control diagrams will include portions of the automatic sprinkler design, fire alarm design, mechanical shop drawings, mechanical design documents, electrical design documents, and architectural drawings. Architectural drawings need to show wall and opening protection ratings, draft curtains, smoke barriers, and passive boundaries as applicable. This results in a comprehensive package of smoke-control design documents that requires careful thought in preparation and review by the contractors and special inspector.

Approved smoke control system features are described in BFDDS Chapter 11, Smoke Control.

Shaft Pressurization Only Systems

06/12/08

The city may require additional information as needed. For preparation information, see description sheet # 1, *Standards for Plans and Drawings*. If you have any questions concerning your application, please visit or call Permit Processing (425- 452-6800) between 8 a.m. and 4 p.m., Monday through Friday (Wednesday, 10 to 4). Assistance for the hearing impaired: dial 711 (Telecommunications Relay Service).

Shaft pressurization is a recognized method of smoke control. Because of the complexity of smoke control systems, it is important that the design documents clearly identify the expected performance of each pressurized shaft. These documents must also clearly identify the expected performance of *each component* in the smoke control system. Components include all passive and active elements that work together to provide smoke control in accordance with International Building Code (IBC) Section 909.

Submittal requirements for this type of permit require this completed checklist and the following details to be submitted. **This submittal checklist must be completed and submitted with the application. Submit 2 sets of documents.**

1. Detailed Design Report (including the smoke control system rational analysis)- based on the conceptual design report, must be prepared by a Professional Engineer competent in the design of smoke control systems and in accordance with IBC 106 and 909.4.
 - The Detailed Design Report must be a bound document, independent of design plans, and minimally include the following:
 - The signature, date and stamp of the professional engineer responsible for the rational analysis/design.
 - General narrative description of the building. This description must include identification of building uses and occupancies as well as passive and active fire protection features that will be a part of the smoke control system.
 - Narrative description of the shaft pressurization system. This description will include such items as:
 - Specific discussion of how smoke control will be initiated in each shaft and the associated system responses.
 - The sequence of operations (including timing, if necessary, to provide for proper door operation or prevent duct implosion or rupture) and the positioning of each damper for every fire scenario.
 - Measurable performance criteria for each shaft.
 - Description of smoke dampers and fire/smoke dampers, including which dampers will be supervised for damper position, the position of unsupervised dampers when smoke control system is active, damper positions upon loss of power, actuation temperature of fire and fire/smoke dampers.
 - Calculations associated with the system design and fan capacities.
 - Identification of where variable frequency drives are to be used for smoke control equipment and method of control.
 - Description of how the periodic self test required in IBC Section 909.12 will be accomplished.
 - Any related material that supports the design of the system.

2. Detailed Event Matrix- must include:

- Every initiating device by address down one column.
- Every smoke control device (i.e. fans, dampers, etc.), and every other event that must occur in order for proper operation of the smoke control system (i.e, HVAC shutdown, etc.) across the top; with prior approval, some devices may be combined.

3. Drawings- The following drawings must be included in a drawing package designated as "Smoke Control System" to differentiate them from any other plans for that job or project:

- To clearly identify the smoke control systems, the background systems and floor plans should be in light line weight, with the pertinent systems in heavy line weight.
- Smoke control system component drawings shall be submitted on current architectural backgrounds.
- Smoke control zone drawings clearly identifying (colored, hatched, etc.) the pressurized shafts.
- Drawings identifying the fire rating of associated smoke barriers.
- Location of fire-fighter's smoke control panel/controls, and room layout.
- The fire-fighter's Smoke Control Panel must be submitted, depicting fan/damper controls and status indication as per Fire Department Development Standard Chpt. 11.
- Smoke control mechanical equipment and ductwork drawings.
- Location and design of the emergency generator and transfer switch rooms per IBC Section 909.11.
- Drawings demonstrating all emergency system wiring methods associated with the pressurization system, from the source (generator) to the device (damper, fan, etc).
 - Drawings must clearly demonstrate pressurization control and power wiring routing and 2-hour protection.
 - Drawings must clearly demonstrate fire alarm wiring routing and 2-hour protection when used to control the pressurization system.

4. A Special Inspector Test Procedure document must be submitted with the smoke control permit in accordance with IBC Section 909.3, and as described in City of Bellevue Fire Department Development Standards, Chapter 11.

- The architect, engineer of record or special inspector must prepare the document as a bound document, independent of the design plans and smoke control report, and minimally address the following:
 - Qualifications of the special inspector and special inspection agency.
 - Summary of the testing to be performed, including:
 - A general description of each smoke control component and zone to be evaluated, and
 - The applicable performance criteria as identified in the smoke control report and IBC Section 909.18.
 - Provide representative test forms and inspection reports that will be used.
 - Anticipated testing schedule, minimally addressing IBC Section 909.18.

To apply for future permits for associated systems (Building, Mechanical, Electrical, Sprinkler, and Fire Alarm), the following details must be included in those submittals. These details and permits are not part of the 42d submittal requirements:

5. **Architectural Plan Submittal:**

- A Concise Narrative Description of the smoke control system and any special requirements of the design must be prepared by the author of the Detailed Design Report. This description will be required to be on every set of associated design plans and be shown on future tenant improvement drawings for the life of the building as described in Sheet 42c.
- Clear identification of the smoke zone boundaries. These boundaries are required to be constructed as smoke barriers and must be appropriately identified, including wall

and/or horizontal listed assembly number and associated assembly details not deviating from the listed assembly.

- A letter prepared by the architect stating that their design satisfies the requirements of the smoke control system. Note: a single letter signed by all disciplines is acceptable.
- Plans must provide the location and design of the emergency generator and transfer switch rooms per IBC Section 909.11. In addition, they must detail 2-hour fire-rated separation of power/control wiring to equipment serving the pressurized elevator and stair shafts.
- Provide seismic anchorage of critical systems and include the design with the associated design submittal, as appropriate (IBC Section 403.14).

6. Mechanical Plan Submittal:

- A Concise Narrative Description of the smoke control system and any special requirements of the design must be prepared by the author of the Detailed Design Report. This description will be required to be on every set of associated design plans and be shown on future tenant improvement drawings for the life of the building as described in Sheet 42c.
- Clear identification of the smoke zone boundaries. These boundaries are required to be constructed as smoke barriers and must be appropriately identified.
- A letter prepared by the mechanical designer stating that their design satisfies the requirements of the smoke control system. Note: a single letter signed by all disciplines is acceptable.
- Plans must include identification of the location and address of all devices that will initiate shaft pressurization, components associated with the smoke control process (including actuators, control dampers, fire and smoke dampers, variable air volume controls, and fans), and associated system responses/configurations.
- Provide capacities of each shaft pressurization fan—including applicable calculations for the number of belts and the operating exhaust temperature.
- Identify equipment locations with inlet and outlets clearly identified and separated in accordance with Amended IBC Section 909.10.3.
- When applicable, design submittals must include the sequence of operations (including timing, if necessary, to provide for proper door operation or prevent duct implosion or explosion) and the positioning of each damper for every fire scenario.

7. Fire Alarm Plan Submittal:

- A Concise Narrative Description of the smoke control system and any special requirements of the design must be prepared by the author of the Detailed Design Report. This description will be required to be on every set of associated design plans and be shown on future tenant improvement drawings for the life of the building as described in Sheet 42c.
- Clear identification of the smoke zone boundaries. These boundaries are required to be constructed as smoke barriers and must be appropriately identified.
- A letter prepared by the fire alarm designer stating that their design satisfies the requirements of the smoke control system. Note: a single letter signed by all disciplines is acceptable.
- Plans must include identification of the location and address of all devices that will initiate shaft pressurization, components associated with the smoke control process (including actuators, control dampers, fire and smoke dampers, variable air volume controls, and fans), and associated system responses/configurations.
- Submittals must also demonstrate the 2-hour fire-rated protection of wiring, when utilizing the fire alarm system for pressurization control functions.

8. Electrical Plan Submittal:

- A Concise Narrative Description of the smoke control system and any special requirements of the design must be prepared by the author of the Detailed Design Report. This description will be required to be on every set of associated design plans

and be shown on future tenant improvement drawings for the life of the building as described in Sheet 42c.

- Clear identification of the smoke zone boundaries. These boundaries are required to be constructed as smoke barriers and must be appropriately identified.
- A letter prepared by the electrical designer stating that their design satisfies the requirements of the smoke control system. Note: a single letter signed by all disciplines is acceptable.
- The location and design of the emergency generator and transfer switch rooms per IBC Section 909.11.
- Generator sizing and minimum run time of the generator for evacuation purposes.
- Demonstrate 2-hour protection of wiring controlling/powering fans serving smoke proof enclosures.
- Panel schedule (industry standard type) for the emergency panel with connected and demand loads.
- Schedule of smoke control components showing equipment, the load in amps or volt-amps, conduit type and size, conductor type and size, and breaker type and size.
- All emergency system wiring methods pertaining to the smoke control.
- Schedule of individual smoke control components starting loads that will start at the same time and schedule of individual smoke control components running loads.
- The total combined loads of smoke control components for start up and run (start up and run shown separately).

9. Sprinkler Plan Submittal:

- A Concise Narrative Description of the smoke control system and any special requirements of the design must be prepared by the author of the Detailed Design Report. This description will be required to be on every set of associated design plans and be shown on future tenant improvement drawings for the life of the building as described in Sheet 42c.
- Clear identification of the smoke zone boundaries. These boundaries are required to be constructed as smoke barriers and must be appropriately identified.
- A letter prepared by the sprinkler designer stating that their design satisfies the requirements of the smoke control system. Note: a single letter signed by all disciplines is acceptable.
- Demonstrate that sprinkler zones are coordinated with smoke zones, as applicable.

Note: Approval of the smoke control system *does not* constitute approval of each component system. Separate fire alarm, sprinkler, building, mechanical, and electrical approvals are required.